

LIQUID ARGON MEASUREMENT STATUS REPORT

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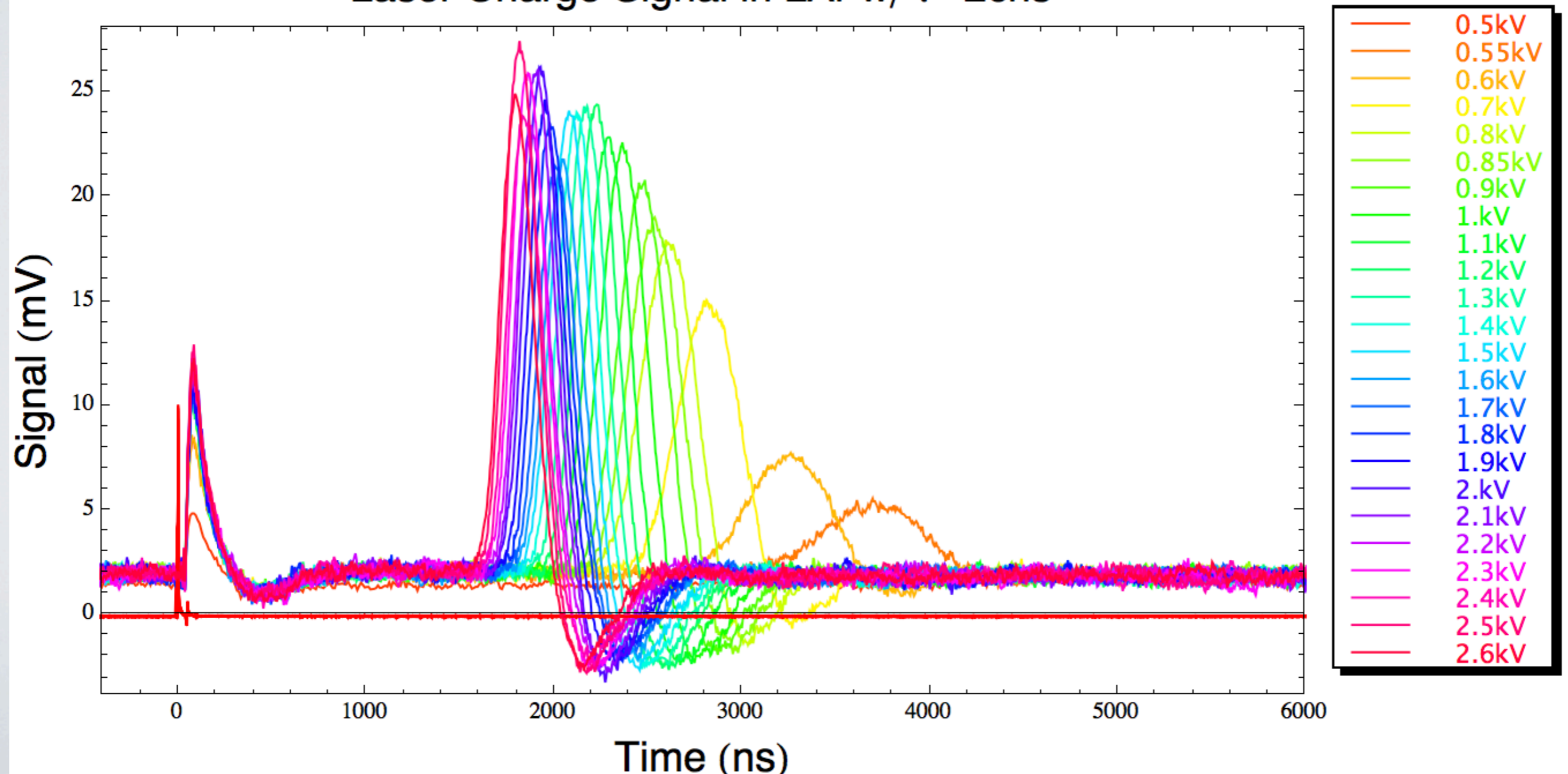
Outlines:

1. Status
2. Data Analysis
3. Summary

More results

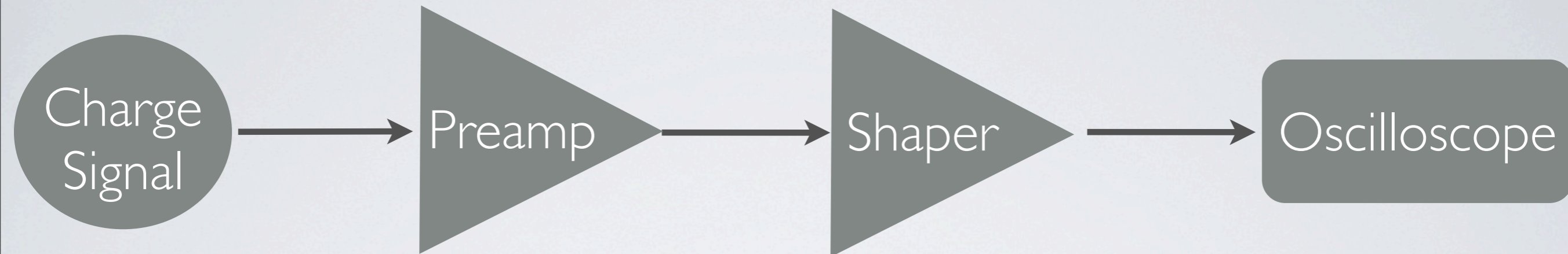
1. The electron signal was measured from 0 field up to 3.0kV/cm with constant laser power.
2. Several data set was taken with all available shaping times.
3. Only 20ns shaping time results are shown are presented here.
4. The signal stability shows dependency on the system vibration.

Laser Charge Signal in LAr w/ $\tau=20\text{ns}$



System Modeling:

1. In order to simulate the charge signal analysis the experimental data. A model is developed including all the components of the system.



2. The model is basically a series of convolutions processes by treating each individual module as a filter:

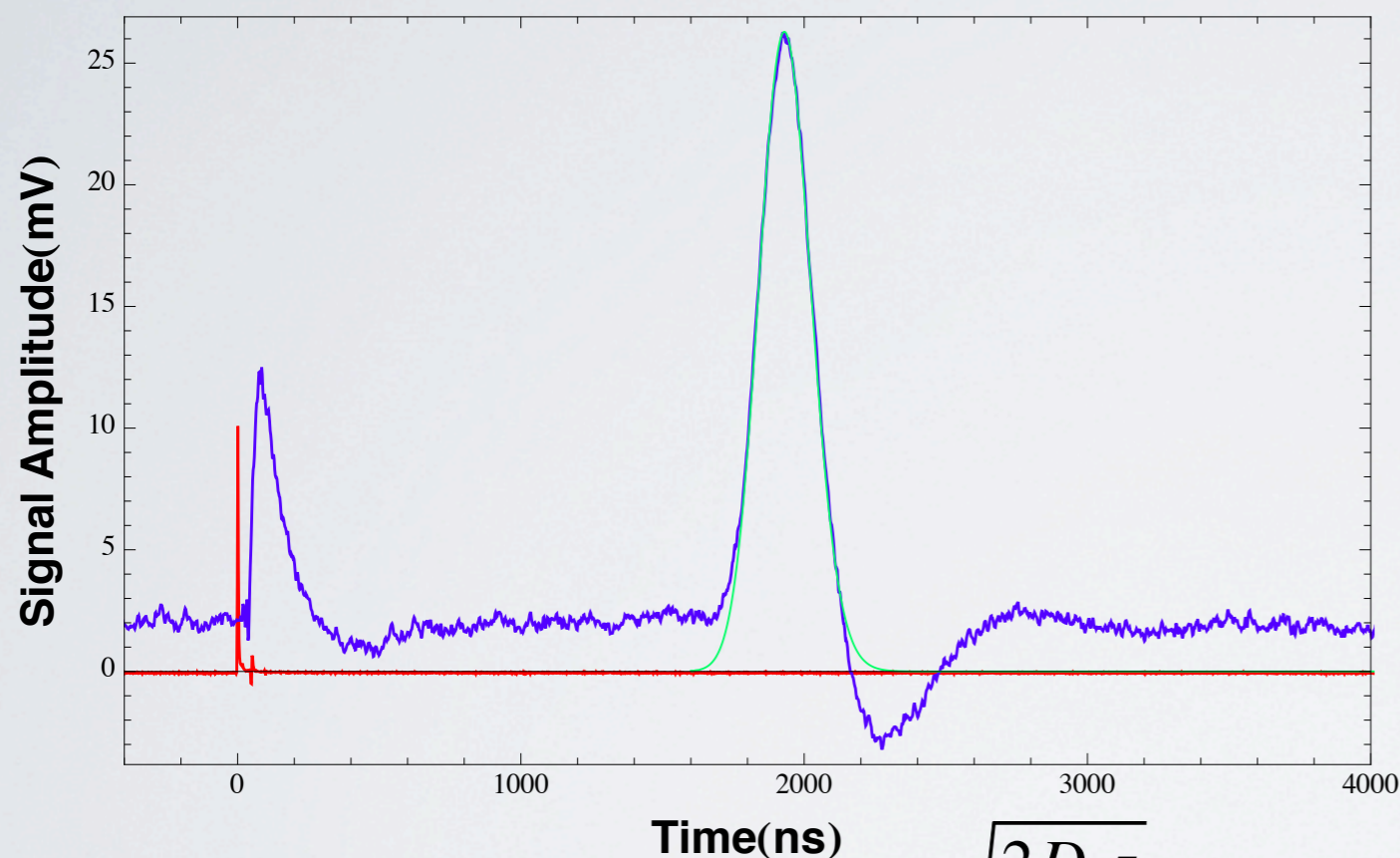
$$V_{out}(t) = V_{electron}(t) \otimes H_{preamp}(t) \otimes H_{shaper}(t)$$

$H(t)$ is the transfer function in time domain

Diffusion Constant Calculation

1. The fit to the electron signal under 2.0kV/cm field is shown for demo.
2. The diffusion constant was calculated using the fit results.

Longitudinal Pulse Fit by the model

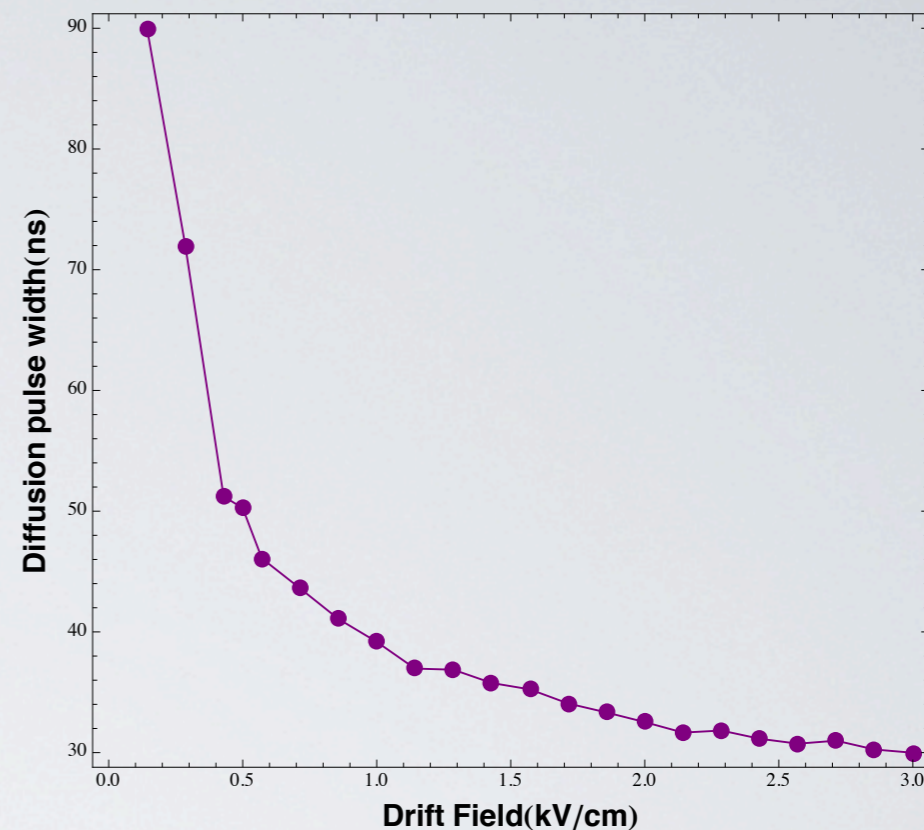


The spatial diffusion is

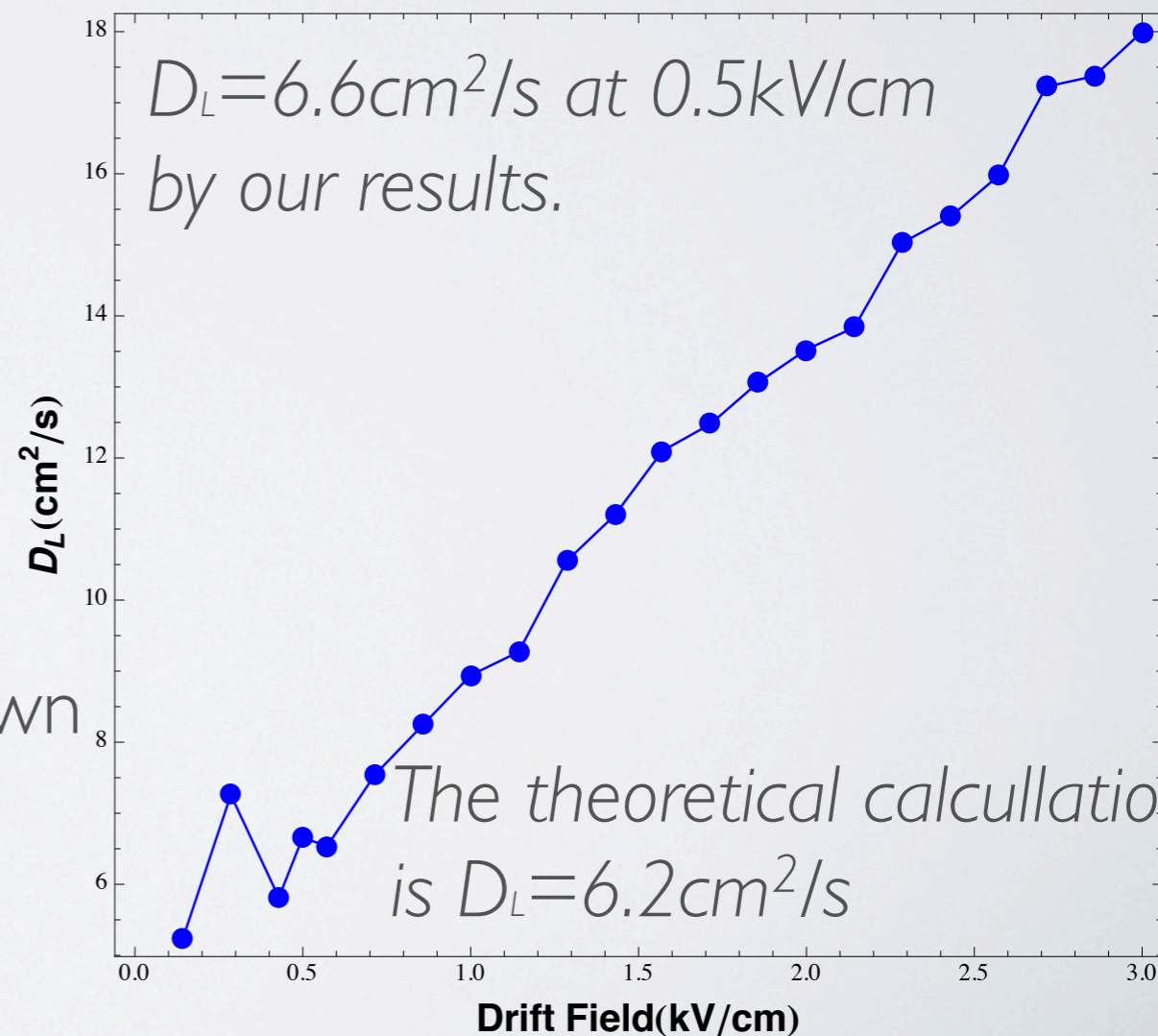
$$\sigma = \sqrt{\frac{2D_L z}{V}}$$

V is the electron drift velocity which is known
 z is the drift distance.

Longitudinal Diffusion Pulse Width



Longitudinal Diffusion Fit by the model



Summary

- The preliminary results of diffusion constants are reasonable.
- The analysis can be improved by implement analysis on the first electron peak.
- More data will be taken to better establish the basic line diffusion measurement.